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(54) Apparatus for injecting bead insulation

(57) An apparatus for injecting bead insulation into cavity walls. The apparatus comprises a pump and a dispensing head, the pump being located between a source of bead insulation and the dispensing head. In use, the pump draws bead insulation from the source into the pump, and pumps the drawn bead insulation to the dispensing head. The preferred apparatus is connectable to a source of adhesive and further including means for introducing said adhesive into said bead insulation at the dispensing head.

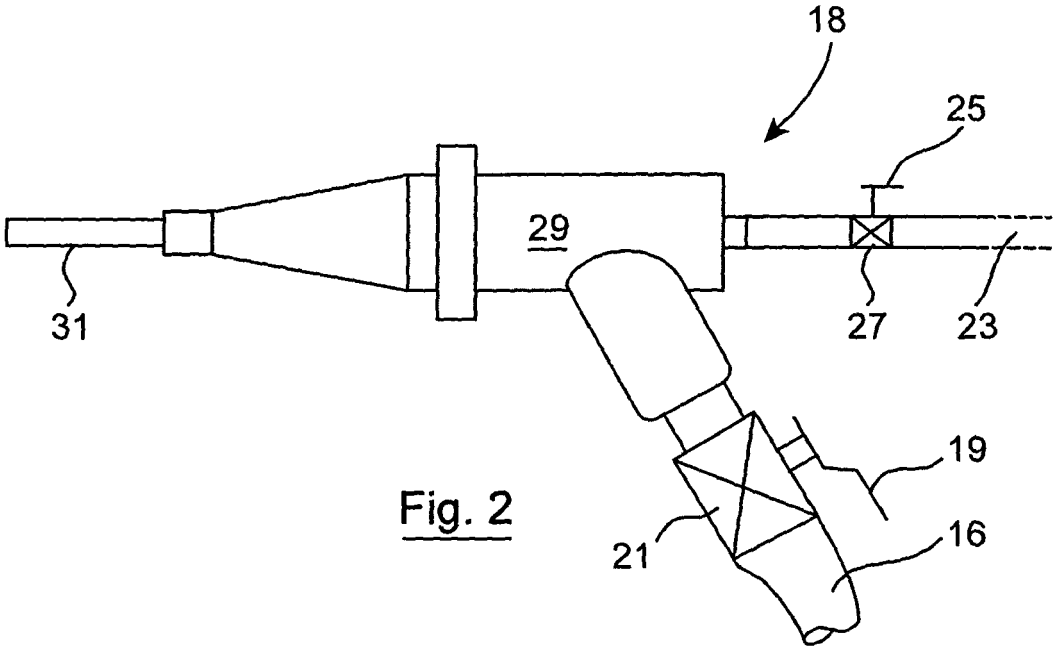

Fig. 2

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Description

FIELD OF THE INVENTION

[0001] This invention relates to apparatus for injecting bead insulation, especially adhesive bonded bead insulation.

BACKGROUND TO THE INVENTION

[0002] Heretofore bead insulation with or without a bonding adhesive has been introduced into existing cavity walls by providing a series of bore holes through one skin, normally the outer skin, of the cavity wall using a gun whose nozzle fits the diameter of the bores. A supply of bead insulation is connected to the gun by a hose. A stream of compressed air is supplied separately to the gun and, by means of the venturi effect, draws the bead insulation into the gun whereupon it is mixed with the stream of compressed air. An adhesive is supplied separately to the gun and is mixed with the bead. The resultant mix of bead and adhesive is forced out of the gun entrained in the compressed air. This system is disadvantageous due to the noise of the compressed air equipment, which typically exceeds 80 dB and, as such, creates a difficult working environment and may exceed legal noise limits. Also, the conventional system requires at least two operatives to control the operation, namely one operative for holding the gun and a second operative to control the air compressor and the supply bead insulation. Moreover, the force created by the compressed air can damage the beads and the adhesive, and can make the conventional apparatus unsuitable for filling all types of cavities. Further, the compressed air has the effect of reducing the operating temperature of the system by about 5°, which, on cold days, can cause the bead/adhesive to freeze and jam in the gun. Also, the compressed air equipment tends to be heavy and so is difficult to transport and manoeuvre.

[0003] It would be desirable to mitigate the above disadvantages.

SUMMARY OF THE INVENTION

[0004] An apparatus for injecting bead insulation, the apparatus comprising a pump and a dispensing head, the pump having an inlet in fluid communication, during use, with a source of bead insulation, typically dry bead insulation, and an outlet in fluid communication with the dispensing head, wherein the pump is arranged to draw bead insulation from said source into said pump, and to pump said drawn bead insulation to said dispensing head.

[0005] Advantageously, the apparatus includes, or is connectable to, a source of adhesive, the apparatus further including means for introducing said adhesive into said bead insulation. Conveniently, the dispensing head includes a mixing chamber, arranged to receive bead insulation from said pump and adhesive from said adhesive source.

[0006] Preferably, said pump includes an impellor housed in a chamber. During typical use, the impellor draws bead insulation into the chamber through an axial inlet and expels it from the chamber via a tangential outlet.

[0007] Advantageously, a first buffer device, e.g. in the form of a blow box, is provided between the pump and the source of bead insulation. The buffer device is arranged to provide a buffer storage area for bead insulation. Typically, the buffer device has an outlet connected (directly or indirectly) to the pump, and an inlet connected (directly or indirectly to the bead insulation source, the outlet being located in use above the inlet.

[0008] Advantageously, a second buffer device is provided between the pump and the dispensing head. The buffer device is arranged to provide a buffer storage area for bead insulation. Conveniently, the second buffer device takes the form of a section of conduit with a relatively large width connected to the outlet of the pump.

[0009] From another aspect, the present invention provides an apparatus for injecting bead insulation into a cavity between two skins of a cavity wall, the apparatus comprising a pump, preferably a centrifugal pump, having a chamber with, preferably, an axial inlet and a tangential outlet, the outlet being in piped communication with a gun and the inlet being in piped communication with a supply of dry bead insulation, the chamber housing an impellor driven by power means, and means being provided to introduce adhesive into the flow of bead insulation prior to discharge into a cavity.

[0010] The apparatus is particularly suited for injecting insulation between two skins of a cavity wall. Each skin may be formed by building using brick and/or block, or the wall may be formed from an inner skin of natural or composite wood panelling and an outer skin of brick or block, or the wall may be formed of two skins of natural or composite wood panelling. The wood panelling may alternatively be substituted by panelling of any other suitable material, for example glass reinforced plastics material (GRP).

[0011] A blow box is desirably provided between the bead supply and the axial inlet. The blow box beneficially has an inlet at or near to its bottom and an outlet at or near to its top, the outlet preferably being at right angles to the inlet.

[0012] Preferably also, a butterfly valve is provided to adjust the speed of flow of bead insulation passing into the pump. The valve is desirably positioned at or near to the top of the blow box, for example in a release port parallel to the inlet.

[0013] The apparatus is preferably mountable on a rear part of a box van with the remaining part, forward thereof, being a reservoir for holding the main supply of bead insulation.

[0014] Preferably further, said introducing means comprises a supply of adhesive held in the pressure vessel

and piped therefrom to the gun.

[0015] Further preferred features are recited in the dependent claims.

[0016] From a further aspect, the invention provides a method of injecting bead insulation in an apparatus comprising a pump and a dispensing head, the pump having an inlet in fluid communication, during use, with a source of bead insulation, typically dry bead insulation, and an outlet in fluid communication with the dispensing head, the method comprising drawing bead insulation from said source into said pump, and pumping said drawn bead insulation to said dispensing head.

[0017] Further advantageous aspects of the invention will become apparent to those ordinarily skilled in the art upon review of the following description of a specific embodiment and with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] An embodiment of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 is a side elevation of an apparatus embodying the present invention; and

Fig. 2 is a side elevation of a gun for use with the apparatus.

DETAILED DESCRIPTION OF THE DRAWINGS

[0019] Referring to the drawings, there is shown, generally indicated as 5, an apparatus for injecting bead insulation. The apparatus 5 is particularly suited for injecting bead insulation, especially bonded bead insulation, into a cavity between two skins of a cavity wall (not shown). The apparatus 5 in the preferred embodiment comprises a pump 10, preferably a centrifugal pump, having a chamber 11 with an axial inlet 12 and a tangential outlet 14. During use, the outlet 14 is in fluid communication with a dispensing head, in the preferred form of an injection gun 18, by means of a conduit 16, e.g. a hose, pipe, duct or other means for conveying bead insulation. The inlet 12 is in fluid communication with a supply of dry bead insulation (not shown) by means of a conduit 22, e.g. a hose, pipe, duct or other means for conveying bead insulation, and, preferably, a buffer device in the form of a blow box 28. The chamber 11 houses an impellor 13, or fan, driven, in use, by power means, conveniently in the form of an electric motor 24. The gun 18 has a first operating mechanism 19 for controlling a valve 21 which in turn controls the delivery of bead insulation from the pump 10 to the gun 18.

[0020] Typically, means are provided to introduce adhesive, which is preferably but not necessarily fire retardant adhesive, into the flow of bead insulation prior to discharge from the gun 18. In the illustrated embodiment, a supply of adhesive is provided in a pressurized vessel 26. A conduit 23, e.g. a pipe or hose duct or other means for conveying adhesive, is provided between the pressurized vessel 26 and the gun 18 for delivering adhesive to the gun 18. The gun 18 has a second operating mechanism 25 for controlling a valve 27 which, in turn, controls the flow of adhesive from the vessel 26 to the gun 18. the adhesive is typically liquid in form.

[0021] In an alternative embodiment (not illustrated) the pressure vessel 26 may be omitted and the gun 18 may be connected to a pumped source of adhesive (not shown), e.g. an adhesive reservoir provided with a pump for delivering the adhesive to the gun 18. The flow of adhesive to the gun may still be controlled by the valve 27 and operating mechanism 25.

[0022] The gun 18 has a mixing chamber 29 in which the bead insulation and adhesive are mixed before being dispensed from the nozzle 31 of the gun 18. The gun 18 is operable by a single operator (not shown) by means of the operating mechanisms 19, 25. Hence, a single operator is able to control the operation of the apparatus 5.

[0023] The blow box 28 is provided between the bead supply and pump 10. The blow box 28 has an inlet 30, which may for example be located at or near to its bottom, and an outlet 32 preferably located at or near to its top.

[0024] The inlet 30 is connected to the conduit 22 to receive bead insulation during use. The outlet 32 is connected to the pump 10, in particular to the inlet 12 of the pump 10, by any suitable means, for example a pipe section 22'.

[0025] A valve 34 is provided to adjust the speed of flow of bead insulation passing into the pump 10. The valve 34, which may for example comprise a butterfly valve, may be positioned at or near to the top of the blow box 28, but is preferably provided in the pipe section 22', i.e. between the blow box 28 and the pump 10. Advantageously, the valve 34 is arranged to control the flow of air from the environment into the flow of bead insulation. For example, the setting of the valve 34 may be adjusted depending on the distance that the bead has to travel before it is dispensed by the gun 18. For longer distances, the valve 34 may be set to increase the flow of air into the system since this helps carry the bead insulation further.

[0026] The blow box 28 comprises a chamber located in the path of the bead insulation between the bead supply and the pump 10. The blow box 28 is typically box like in form, e.g. being of substantially rectangular cross section, but may take any other suitable form. For example, it may take the form of a section of conduit (not illustrated), preferably having a bore that is wider than the bore of the conduit 22 that feeds into it. The outlet 32 is preferably located substantially at the, in use, top of the box 20 (and therefore at the top of the chamber) and is typically arranged to be above, in use, the inlet 30. Hence, any bead insulation that is located in the blow box 28, or is introduced into the blow box 28, during the time in which the motor 24 is switched off and the impellor is

running down, will tend together, under gravity, in the chamber of the blow box 28. This helps to prevent the bead insulation from entering the impellor chamber 11 after the motor 24 has been switched off, and this in turn helps to reduce the chance of bead insulation jamming the impellor 13. The blow box 28 therefore acts as a buffer between the bead supply and the pump 10.

[0027] Advantageously, the conduit 16 includes a buffer portion 16A adjacent the pump 10. Conveniently, this is provided by a section of the conduit 16 being of larger diameter than the subsequent section of the conduit 16', although may take any other suitable form. Preferably, the transition between the buffer section 16A and the subsequent section 16' takes the form of a funnel. By way of example, the conduit 16 may have a diameter of approximately 38 mm, while the buffer section 16A has a diameter of approximately 75 mm. During use, the buffer section 16A provides a space in which bead insulation, which would otherwise be held in the chamber 11, to leave the chamber 11 and be stored in the buffer section 16A. This reduces the chance that the bead insulation will jam the impellor 13. This is particularly useful when, for example, the pump 10 is switched off and/or when a user closes valve 21. Preferably, the volume of the buffer section 16A is at least equal to the volume of the chamber 11. In order to empty the chamber 11 of bead, for example when the impellor 13 is running down, the valve 34 may be opened to increase the flow of air into the conduit 22'. This has the effect of reducing the quantity of bead being inducted into the conduit 22' from the blow box 28 while providing an increased quantity of air to assist in expelling bead from the chamber 11.

[0028] By way of example, the impellor may be arranged to rotate at approximately 1,500 rpm during normal use. The diameter of the impellor may, for example, be in the region of 20 to 40cms.

[0029] Conveniently, the apparatus 5 is mounted between two stands 51 and 53. The pressure vessel 26 may conveniently also be mounted to the stand 53.

[0030] The apparatus 5 is capable of injecting bead insulation at pressures that are less than would normally be achieved using a compressed air system. As a result, the apparatus 5 is capable of injecting insulation into relatively fragile structures, for example the inter-leaf cavities of a timber framed building structure.

[0031] The supply of bead insulation may be provided in any suitable container, for example, a stand-alone silo, or a container or compartment located in the payload area of a van, or any other suitable container. The container includes an air inlet, or at least is not air tight, to allow the pump 10 to create a flow of air by which the bead may be drawn to the pump 10 and then expelled to the gun 18.

[0032] In use, when the pump is running, bead insulation is drawn into the pump 10 via the conduit 22, blow box 28 and pipe section 22', from the bead supply. The bead insulation enters the chamber 11 via inlet 12 and, under the action of the impellor 13, and is driven out of the chamber 11 via outlet 14. The bead insulation is then conveyed to the gun 18 via the conduit 16. The adhesive is also supplied to the gun, under pressure, from the pressurised tank 26 via conduit 23. Using the operating mechanisms 19 and 25, the operator is able to cause the adhesive and the bead insulation to mix in the mixing chamber 29 and subsequently to be dispensed via the nozzle 31.

[0033] By way of example, the adhesive may comprise any suitable bead adhesive or other bonding agent and is typically liquid in form. Also by way of example, the bead insulation may comprise beads formed from polystyrene or other thermally insulating material, especially expandable polystyrene (containing an expanding agent, for example, pentane), or foamed plastics particles.

[0034] The apparatus 5 is relatively compact, and so is amenable to being mounted on a rear part of a van, e.g. a box van (not shown) with the remaining part of the van, forward thereof, being or carrying a reservoir for holding the main supply of bead insulation. Advantageously, the van may be, for example, a 3.5 tonne vehicle rather than, say, a lorry of 7.5 tonne, in which case driver restrictions due to HGV grade requirements are obviated.

[0035] The invention is not limited to the embodiment(s) described herein which can be modified or varied without departing from the scope of the present invention.

Claims

1. An apparatus for injecting bead insulation, the apparatus comprising a pump and a dispensing head, the pump having an inlet in fluid communication, during use, with a source of bead insulation, and an outlet in fluid communication with the dispensing head, wherein the pump is arranged to draw bead insulation from said source into said pump, and to pump said drawn bead insulation to said dispensing head.

2. An apparatus as claimed in claim 1, wherein the apparatus is connectable to a source of adhesive, the apparatus further including means for introducing said adhesive into said bead insulation.

3. An apparatus as claimed in claim 2, wherein the dispensing head includes a mixing chamber arranged to receive bead insulation from said pump and adhesive from said adhesive source.

4. An apparatus as claimed in any preceding claim, wherein said pump includes an impellor housed in a chamber.

5. An apparatus as claimed in any preceding claim, wherein, the pump has an axial inlet through which bead insulation is drawn from the bead insulation source during use, and a tangential outlet through

which bead insulation is expelled during use.

6. An apparatus as claimed in any preceding claim, further comprising a first buffer device located between the pump and the source of bead insulation and arranged to provide a first buffer storage area for bead insulation travelling, in use, from the bead insulation source to the pump.

7. An apparatus as claimed in claim 6, wherein said first buffer device has an outlet in fluid communication with the pump, said buffer storage area being located in use below said outlet.

8. An apparatus as claimed in any preceding claim, wherein a second buffer device is provided between the pump and the dispensing head, the second buffer device being arranged to provide a buffer storage area for bead insulation for bead insulation travelling, in use, from the pump to the dispensing head.

9. An apparatus as claimed in claim 8, wherein the pump is connected to the dispensing head by means of a conduit, the second buffer device comprising a section of conduit with a width that is greater than the adjacent section of conduit.

10. An apparatus as claimed in claim 8 or 9, wherein said second buffer device has a volume at least substantially equal to the volume of said impellor chamber.

11. An apparatus as claimed in any one of claims 8 to 9, wherein said second buffer section is located adjacent said pump.

12. An apparatus as claimed in any preceding claim, wherein an air inlet valve is provided to control the flow of air into bead insulation travelling in use from the bead insulation source to the pump.

13. An apparatus as claimed in claim 13 when dependent on claim 6 or 7, wherein said air inlet valve is provided between said first buffer device and said pump.

14. An apparatus as claimed in any preceding claim, further including an operating mechanism located substantially at said dispensing head and arranged to control the flow of bead insulation into said dispensing head.

15. An apparatus as claimed in any one of claims 2 to 14, further including an operating mechanism located substantially at said dispensing head and arranged to control the flow of adhesive into said dispensing head.

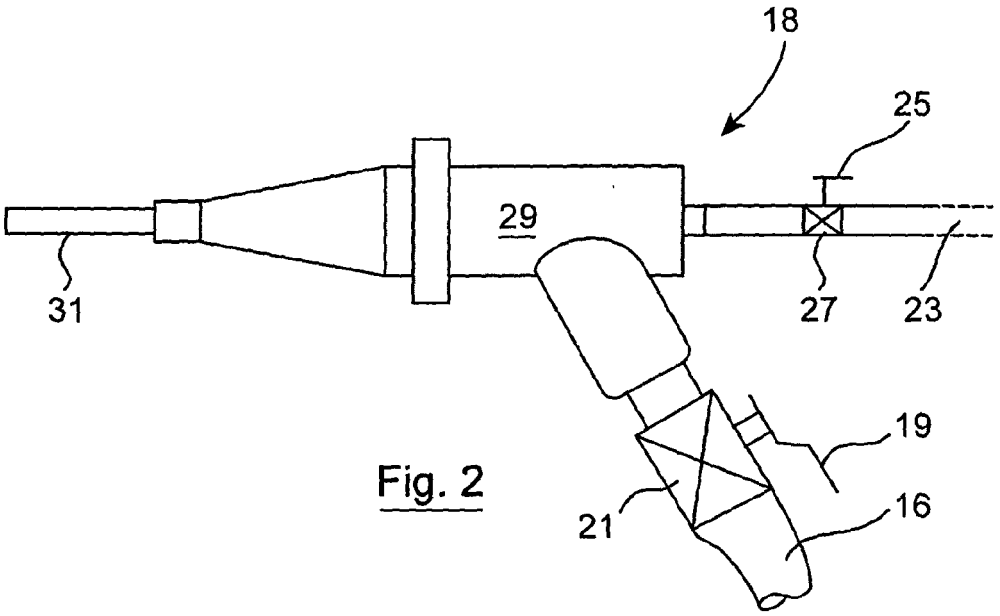
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Fig. 2

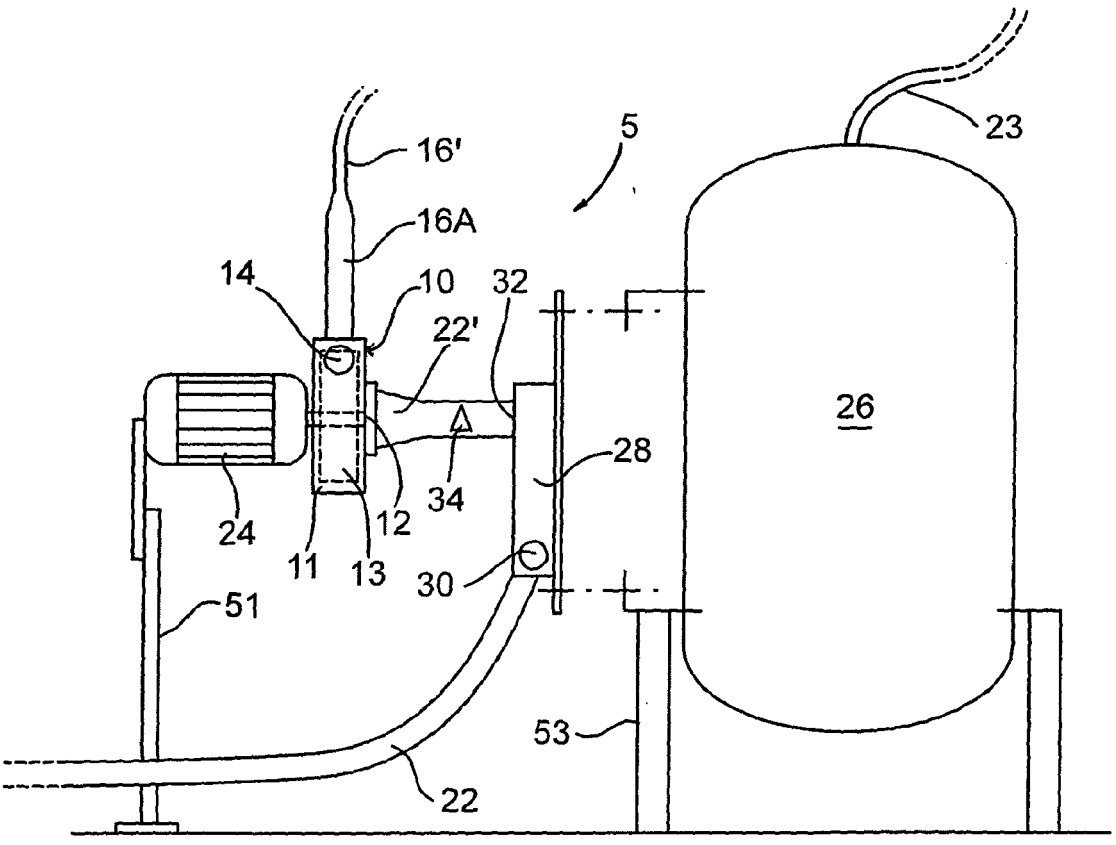
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Fig. 1